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THE

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# GLACIAL STUDIES IN GREENLAND.

DURING the past summer it was the privilege of the writer to visit Greenland as geologist to the Peary Auxiliary Expedition, and to study some of the glaciers of its middle and northern portions. A sketch of the observations made, so far as they are deemed worthy of publication, and a discussion of their bearings will be attempted in a series of articles to which this is introductory. While the itinerary form, which is quite the fashion in Arctic literature, will not be followed, an outline of the journey may perhaps give some glimpses of Arctic conditions that will be of interest, and possibly of service, to those who have occasion to consider the ways and means of studying in the far north. Incidentally, it will be convenient to introduce some miscellaneous observations made on the way, which would not readily find place in a formal description or discussion of the glaciers.

Provision was made for the expedition by Lieutenant Robert E. Peary, Civil Engineer, U. S. N., last year, before leaving the United States on his third trip to Greenland. Its primary object was to communicate with his party, with the alternative purpose of supplementing its outfit, if necessary, should it remain, and of offering it a means of return, should its work be finished. A collateral object was to do such independent scientific work in geographical, biological, ethnological, and glacial lines as time and conditions might permit.

The expedition was organized and directed by Mr. Henry G. Bryant, Secretary of the Geographical Club of Philadelphia, whose exploration of the Grand River of Labrador is well known. The party was limited to seven, the six additional members being: Professor William Libbey, Jr., of Princeton University, geographer; Dr. Axel Ohlin, of Sweden, zoölogist; H. L. Bridgman, of Brooklyn, historian; Emil Diebitsch, of Port Royal, S. C., civil engineer; Dr. H. Emerson Wetherell, of Philadelphia, surgeon; and the writer. It was arranged that on reaching Inglefield Gulf my work might be conducted independently of the rest of the party, who proposed to make such examination of the coast of Ellesmere Land and Jones Sound as the condition of the ice would permit.

The party assembled at Brooklyn on June 20th, and took passage for St. Johns, Newfoundland, on the regular coasting steamer, Portia, of the Red Cross line. A few hours' stop was made at Halifax, which gave a little opportunity to see the interesting drift at that point. St. Johns was reached on June 25th without noteworthy event, unless it be that an iceberg south of Newfoundland, two at the entrance of St. Johns Harbor, and three or four on the distant horizon, gave a feeble prophecy of the ice conditions that were in store for us at the north. We remained at St. Johns awaiting the fitting out of the Falcon, a sealing steamer which had been chartered for the trip, until the 7th of July. The larger part of the interval was spent in the study of such geological formations as were accessible, especially glacial deposits. By the kindness of Dr. Taite I was able to see the interesting formations between St. Johns and Petty Harbor. Through the good offices of Mr. James P. Howley, government geologist, and the signal generosity of the Messrs. Reid, builders and operators of the Newfoundland Western & Northern Railway, Dr. Ohlin, Dr. Wetherell, and myself were permitted to spend four days in the interior, with all the facilities and comforts which a special train, under the personal direction of Superintendent Reid, could give, and with the added felicity of the lucid explanations of Mr. Howley, covering not only the region immediately traversed, but very much beyond. The road is in process of building for the government, and most of the excavations are fresh and unmodified. Our trip extended about 250 miles into the interior. I hope to give some of the results in the JOURNAL during the year.

It is worthy of more than passing note that Mr. Howley, as government geologist, was entrusted with the location of the preliminary line for this road, and, though it bisects the island, passing through a wooded and almost wholly unsettled region, he was able to lay it down with such fullness of knowledge and good judgment that only slight departures were found advisable on fuller surveys. It is equally gratifying to make note of a government reposing the determination of the most important feature of its greatest commercial undertaking in the hands of its scientific adviser. The builders and operators of the road, the Messrs. Reid, appear equally appreciative of Mr. Howley's knowledge and counsel. The road is to terminate at the southwestern angle of the island, traversing the coal beds of the southwestern portion which Mr. Howley has recently exploited with favorable results. The completion of the road and the establishment of a steam ferry to Cape Breton will very greatly improve the now very poor communication between the mainland and St Johns, the point of departure, directly or indirectly, of so many Arctic expeditions.

On the 7th of July the Falcon, a stanch, full-timbered sealing steamer, specially fitted for ice work, and commanded and manned by experienced Arctic navigators, was ready, and the start was made.

Our course was direct to Cape Desolation, South Greenland. The voyage was almost without incident to that point, very little ice being seen. On the day after departure I noticed only two small masses of ice, on the day following, only one, and on the next two days, none at all. When this is compared with the much larger amount of ice reported off the coast of Labrador and Newfoundland by other vessels, and with the observations made on our return voyage, it seems to warrant the inference that the berg-bearing current was comparatively narrow, and that it hugged the mainland coast somewhat closely. If this is a general fact, the total amount of ice drifting south is liable to be exaggerated in estimates based on the reports of coasting vessels. My observations farther north lend support to this; but of course the observations of a single voyage are much too slender to justify a conclusion.

Early on the morning of the 12th we sighted Cape Desolation, which lies about 150 miles west-northwest of Cape Farewell. The first glimpse of the topography of Greenland was full of suggestiveness. The aspect of its coastal mountains at once arrested attention on account of their marked ruggedness and angularity. The sky lines were strongly serrate, and the lower angles generally sharp and harsh, except, in some measure, near the base. Flowing contours did not much enter into the general view, though they might be found here and there by search. The dominant lines of sculpture lay in vertical, not in horizontal, planes. The inference was, therefore, close at hand that they owe their fashioning to the familiar meteoric agencies that work vertically, and not to the horizontal rasping of ice flowing out from the interior. This may not be wholly true of the lower contours which could not be seen to good advantage. Glimpses of the great inland ice cap were caught at intervals between the mountain peaks. According to the charts of Greenland, the border of the inland ice here lies but a few miles back from the coast line, and this nearness intensifies the significance of the unsubdued angularity of the coastal mountains. The bearing of this angular topography upon the problem of the former extension of the ice, and especially upon the broad question whether the ice sheet of Greenland once crossed the Baffin basin and became the source of the North American glaciation, as held by some geologists, at once presented itself, and stimulated as careful a scrutiny of the coastal topography as was practicable. This line of observation was continued assiduously throughout the whole length of coast followed, from Cape Desolation to Inglefield Gulf, as far as the circumstances of the voyage permitted, both going and coming. Fogs and night made many breaks in the series, but out of the something more than 1100 miles of coast skirted, sufficient was seen to afford a fairly good basis for drawing a conclusion, so far as this kind of inspection would justify one at all. As I hope to discuss these observations collectively, they will not be further referred to in this sketch.

We had little more than come near enough for a clear view of the coast of Greenland before we encountered the outer edge of the East Greenland ice pack. It is an interesting fact that the well-known Arctic current which flows southward along the eastern coast of Greenland, bearing a formidable ice pack, curves around Cape Farewell and follows the western coast *northward* for several degrees of latitude, though it becomes broadened and scattered somewhat in this portion of its course. It then gradually recurves to the west and south and descends the Labrador coast, its burden of ice being progressively melted and dispersed. The charts name Holstensborg, which lies about seven degrees north of Cape Farewell, as the limit of this north-flowing current.

We found this stream of floe ice very compact and closely hugging the coast south of Cape Desolation. An estimate of its breadth by an officer of the vessel was fifteen or twenty miles, but a liberal allowance for probable error should doubtless be made. It is reported to be often much wider than this. At the point we encountered it the outer edge was quite sharply defined, and although the sea was unusually calm, the presence of the pack was announced at some distance by a continuous roar arising from the action of the ocean swell on the border of the crowded floes of ice. Outside of this compact stream, small masses of much eroded ice were scattered over a narrow belt, forming a slight bordering fringe. The ice of the main pack was quite firm and solid. To a large extent it retained its original tabular form, but not a few of the masses were reduced to very irregular and often very picturesque shapes. The melting to which all had been subjected was notably more rapid at the edge of the water than either above or below, and the result was a girdling incision at the water level tending to reduce the mass to a double tabular form, which was sometimes carried so far as to approach the hour-glass form. The thinner, and usually smaller, table was naturally above, and the thicker and larger below, for the obvious reason that the greater mass of the ice was submerged. The breaking away of segments of these tables and various other inequalities of reduction often resulted in the tilting of the mass and the establishment of a new zone of maximum melting, leading on to further inequalities. While other agencies participated in forming the odd shapes assumed by the larger masses of ice, they appear to have been chiefly due to the superior rate of melting at the water's edge. It was only when the process of dissolution had reached an advanced stage that the more unique and fantastic forms were usually assumed. These were naturally most prevalent among the scattered masses on the border that were more freely bathed by the warmer surface water of the open sea.

The odd forms usually have, as a common feature, a submerged, massive base from which irregularly eroded portions stand forth. This base is the remnant of the lower table already mentioned, which retains much of its massiveness after the air and surface water and direct sunlight have wasted the upper part. To these massive bases the floes often owe their preservation long after their own slenderness and ill-balanced proportions would have wrought their destruction. Fragile columns, with or without entablatures, slender pinnacles, and delicate forms of various types, stand forth from these submerged bases, giving, at a little distance, an impression of such fragility as to lead one to wonder how they retained their integrity, until a near approach revealed the substantial base. A great variety of imitative forms are observable. Often the exserted portions resemble the limbs of an inverted animal. Not uncommonly the more massive projections from the submerged base stand forth like the prows and poops of oriental ships. Resemblances to mythological creatures, to architectural structures, to sea birds, to plants, and likenesses of all sorts might be imagined without much exercise of the fancy. These odd forms, however, were quite subordinate in size and number to the simpler thick pans merely worn more or less about their edges. The aggregation of these made up the great mass of the ice pack.

The ice of the floes was often very thick, and, although no measurements were made, it seemed within safe limits to estimate the depth at fifteen to twenty feet and occasionally more. It retained so much of its integrity of structure as to give exquisitely beautiful tints of green and blue. The blue tones appeared to be chiefly due to light transmitted from the sky, the green to light that arose from beneath the water, thrown back by submerged, projecting shelves. The intergradation of tints was beautiful beyond expression.

A few, but only a very few, icebergs were embraced in the ice pack; from which the inference is drawn that either the East Greenland glaciers do not freely put forth icebergs, or that they still remained locked up in the icebound harbors of the coast. The same inference must be extended, I suppose, to the glaciers of the west side so far as skirted by this current. The process of developing fantastic forms among the icebergs was apparently identical, in large part, with that involved in the sculpturing of the ice floes.

But I have run ahead of my narrative somewhat. On encountering the border of the pack off Cape Desolation about nine o'clock on the morning of the 12th, the course of the vessel was turned westward and skirted its edge until midday, when the pack was found more scattered, and the Falcon entered it, worming her way from opening to opening, for the greater part, but forcing a passage by direct collision when necessary. The floes, however, continued to be measurably thickset, particularly toward the coast. A direct crossing of the stream seemed to grow more difficult as it was penetrated, and towards evening the course of the vessel was directed to the westward to escape the closer packed ice near the coast. Several hours were required to reach the more open portion, and during the night, and most of the following day, there were frequent encounters with belts of ice. These were usually separated by tracts of open water. The northern limit of the ice pack, as seen by us, lay nearly opposite the Fredrickshaab glacier, Lat. 62°30′. This gives an extent along the coast north of Cape Desolation of about three degrees.

The wrapping of the East Greenland ice pack about the southern extremity of the island greatly affects the climate of the coast, and doubtless the glaciation of the interior. The harbors of this part of the coast are reached only with difficulty during the early part of the summer; indeed, during June and July the coast between Lat. 60° and 65° is less accessible than that between Lat. 65° and 70°. We found East Greenland ice still in the inlets and among the islands about Goodhaab (Lat. 64°) on our return in the early part of September.

As previously remarked, comparatively few icebergs were seen among the floes from East Greenland. Soon after our escape from the pack, a feeble train was observed nearly opposite the Frederickshaab glacier. Only a dozen rather small icebergs composed the procession. Beyond these, few icebergs were seen until, two days later, we encountered a grand procession streaming out from Disco Bay.

While we were immediately opposite the Frederickshaab glacier, the coast was shrouded in low clouds and fog. But these cleared away before we were out of the range of vision, and, through the aid of field glasses, we had a measurably satisfactory, though distant, view of this most beautiful glacier. Our position was such as to make its magnificent profile, as it issued from among the peaks of the coastal mountains and stretched, with a gentle decline, far out on the lowlands that form the immediate shore, the most striking element presented. Notwithstanding its great massiveness, its freedom from constriction, and its relatively gentle decline, it was strongly crevassed at some points on its flanks, and on its crest line. On its lateral border vertical ice-walls appeared, but from our position I could not detect any at the extremity.

On the evening of July 15th, we encountered a grand procession of icebergs moving southwesterly from Disco Bay, into which they had been discharged (with perhaps few exceptions) by the Jacobshaven glacier. Thirty were in sight at once. It was not so much the number, nor the size, as the variety and picturesque beauty, that commanded admiration. The Jacobshaven icebergs are noted for their pinnacled and angulated forms. It is even held by Greenlanders that they may be distinguished from the bergs of other glaciers by their distinctive forms. From what I saw, I should think this measurably true.

Early on July 16th, we arrived at Godhaven, on the south side of Disco Island, and, after the customary formalities of entrance to a Greenland port, visited the lower glacier in Blase Dale, which creeps down from a local ice cap covering the southwestern uplands of the island. This glacier was again visited on our return, forty-eight days later, and this constitutes the longest interval afforded me for the study of seasonal effects on the surface of the same glacier. Disco Bay was found thickly dotted with Jacobshaven icebergs, and presented a most enchanting picture, set off, as the picturesque ice masses were, by a calm, blue sky, a clear, genial atmosphere, and the red-brown cliffs of Disco Island. While at Godhaven we were fortunate enough to secure specimens of the famous "Ovifak" iron.

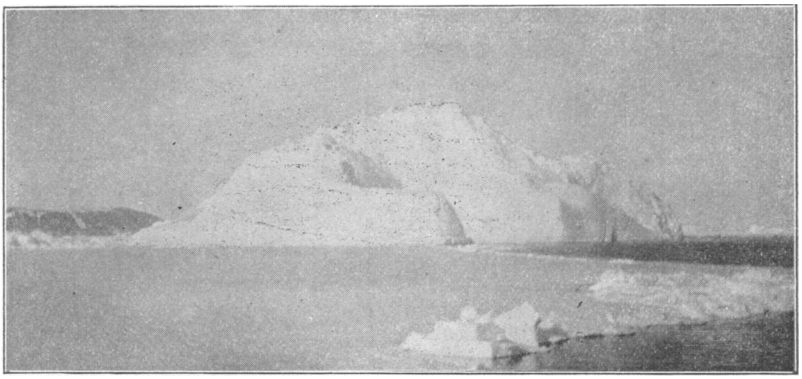

FIG. 1. Iceberg off the Crimson Cliffs, northern part of Baffin's Bay. Characteristic floe-ice of the region in the foreground.

Leaving Godhaven on the evening of July 17th, we skirted the west coast of the island, and on the afternoon of the 18th encountered a magnificent procession of icebergs emanating from the Umanak Fjord. These were much larger, but more tabular and less picturesque, than those derived from the Jacobshaven glacier. Thirty or forty of the larger order were in view at the same time, besides many smaller ones. They probably came from the great Karaiak glacier. Their drift was southwestward. A more scattered procession moved parallel to this on the north. It appeared to come from the straits between Ubekyendt Island and the Svarten Huk Peninsula, and was doubtless chiefly derived from the Kangerdluksuak glacier.

During the night of the 18th the first northern pack ice was encountered at a point south of Upernavik, between latitudes 72° and 72° 30′. This ice was much thinner and more completely tabular than that of the East Greenland pack previously described. It lay lower in the water, and was usually confined, even in its most solid portions, to a thickness of from three to five feet. Except where broken up at the edges by the collision of the pans, it presented little relief from the water's surface. The general expression throughout the whole of the northern portion of Baffin's Bay, so far as seen by us, was not unlike that of ordinary river or lake ice when broken up, save in its greater expanse. In this respect it contrasted somewhat markedly with the East Greenland ice, which, by reason of the tilting of the thick masses, due to irregular melting, presented a quite unequal surface. These differences, which spring from original differences in the thickness of the parent ice sheets, doubtless point to different conditions of origin and history. The floe ice of the upper part of Baffin's Bay is chiefly the product of a single season, that of East Greenland may be inferred to be the product of several seasons' cumulative work, or else to come from a region of much more intense cold, and more prolonged season of low temperature; the former more likely than the latter.

On the 19th much ice was met, which to the experienced officers of the ship clearly foretold the unusual amount of ice which we subsequently met to the northward. A most charming view of the "midnight sun" was presented that night, as the vessel zigzagged its way through the ice floes that filled the whole horizon and gave a strange, wintry aspect to the whole scene.

The hope of the captain was that, turning away from the coast near Upernavik, he might be able to effect the "middle passage" across Melville Bay, direct to Cape York, but early on the morning of the 20th, after about a day's struggle with the ice, the attempt was abandoned, and the Falcon turned back toward the coast. All day she worked about through the leads, or bunted her way from one to another, in the endeavor to reach the more persistent lanes of water that are usually developed between the moving ice of the bay and the stationary ice that still remains attached to the shore. Success in this was reached during the evening, and the sail of the 21st was a continuous delight, as the vessel followed a broad lane concentric with the coast of Melville Bay, affording a rare opportunity of studying with our glasses the undulating slope of the inland ice that forms the horizon throughout almost the entire circuit of the bay. From the extensive ice walls at its margin numerous large icebergs had

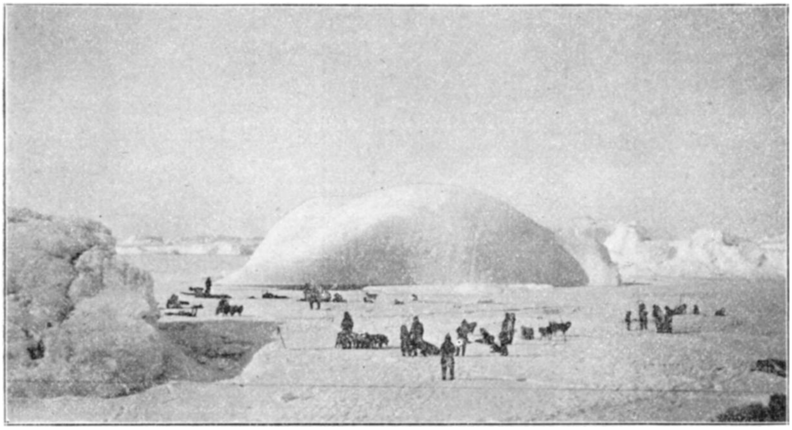

FIG. 2. Icebergs of Cape York ; still held in the bay ice that remains attached to the shore. The point of view is about two miles off Cape York, which lies a little to the left of the picture. Cape York Eskimos in the foreground.

broken away, but were still detained in the fixed bay ice. A series of promontories and nunataks break the continuity of the ice border. The most remarkable of mirages occupied large segments of the horizon nearly all day, and limited the field of good observation, but their extraordinary character (there being two, three, and even four reflecting horizons superposed on each other, giving rise to imitations of castellated structures of the most fantastic and beautiful forms) was some compensation for the illusions they constantly threw over large portions of the landscape.

That afternoon, when within sight of Cape York, and in the highest spirits over the delightful passage of so much of the dreaded Melville Bay, the lane we had followed to so great advantage led away from the land, and became broken and intricate. During the night the ice closed upon the vessel while trying to force her way through a narrow passage, and she was nipped astern and her rudder severely strained, but not permanently injured. The vessel was held fast, with a strong "list," all the following day, which was Sunday, and so, by no virtue of ours, the day became "a day of rest" and, I need scarcely add, of more than puritanical sobriety. About three o'clock next morning, however, the ice relaxed, the vessel settled back to her normal position, and again began threading and ramming her way through the pack with such success that by ten o'clock she was in a wide lane leading to Cape York, which was reached at noon; or, to speak more accurately, the fixed ice, which extended about two miles out from the cape, was reached. During a short stop here specimens of the rock in place (gneiss) and of the drift (gneisses, granites, syenites, red and white quartzites, etc.) were collected, photographs of the glaciers and the icebergs were taken, and a few general observations made. The bay east of the cape was full of icebergs derived from the glaciers that debouch into it, and at its mouth there was a very notable cluster, probably aground. Numerous large icebergs also lay along the coast northwest of Cape York, skirting the "Crimson Cliffs" as far as Conical Rock. As we sailed along these Crimson Cliffs (their color is due in part to "red snow," *protococcus nivalis*, and in part to red lichens, and not to the hue of the rock) I noted eleven glaciers, or glacial lobes, coming down from ice caps whose heights did not exceed three thousand feet. A few miles beyond lies the Petowik glacier, about seven miles wide. It descends by a gentle inclination from the inland ice, its course being unusually direct, and its surface smooth and unruptured by crevasses. In general habits and relations, it resembles the great Frederickshaab glacier, but it is smoother, less massive, and much less impressive.

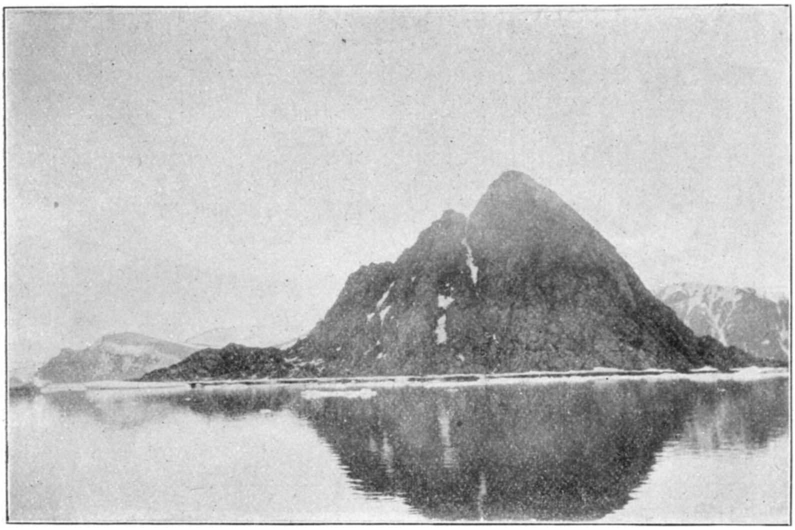

FIG. 3. *Contrasted Topographies.* No. 1.— Dalrymple Rock, near the Greenland coast at the mouth of Wolstenholme Sound, about 77° N. Lat. Formed of hornblendic gneiss. Illustration of angular outlines.

On the morning of the 24th we were off the mouth of Wolstenholme Sound. A landing was made at Dalrymple Island, one of the notable nesting haunts of the eider duck. While the hunters of our party made a generous addition to our provisions, I secured an excellent set of specimens from the finely foliated series of hornblendic gneisses that form the island. Saunders Island, which lies not far to the north, was an interesting object, as it is composed of conspicuously stratified red rock (with little doubt sandstone) banded with gray layers. As almost the whole of the coast to the southward is composed of crystalline rock, the introduction of the clastic series here commands an interest it would not otherwise possess. Wolstenholme Island, to the southeast, presents the same appearance as the "Crimson Cliffs," which are gneissic. Distant views of the glaciers in and north of Wolstenholme Sound, and of the ice cap covering the adjacent plateaus, were afforded.

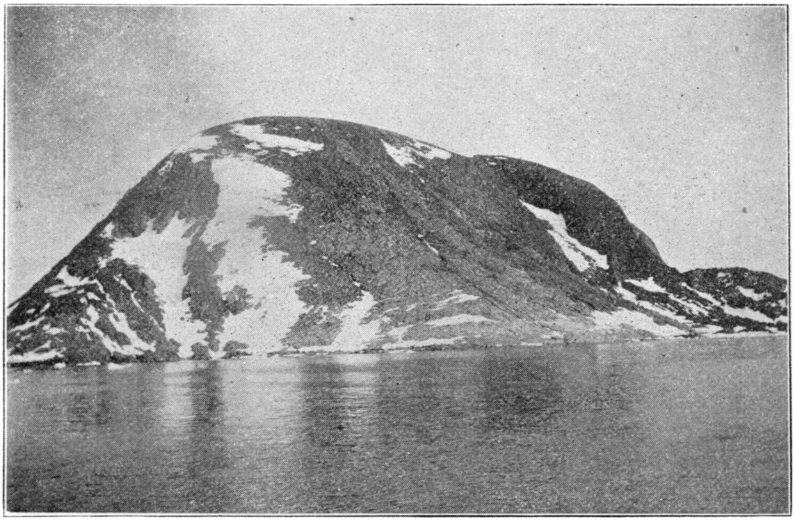

FIG. 4. *Contrasted Topographies.* No. 2.—Southeastern Carey Island. Situated in the midst of the northern part of Baffin's Bay, thirty or forty miles from the Greenland coast, W., N. W. from Dalrymple Rock, and formed of almost identical rock. Illustration of rounded outlines.

One of the missions of the expedition was to search for further information respecting the missing Swedish naturalists, Björling and Kallistenius, who were wrecked on the southeasternmost of the Carey Islands, two years ago. The course of the Falcon was therefore turned westward toward them. A landing was effected during the afternoon, and the search continued until midnight, with no better results than the mournful satisfaction of finding many relics of the unfortunate party, and of collecting, and re-interring with burial service, the bones of one of the party, which had been disinterred from their shallow grave and scattered about, apparently by burgomaster gulls. Collections of rocks were made from the islands, which are gneissic. Foreign drift was found on them, the significance of which is quite important taken in connection with other data gathered with reference to the former extension of the ice. This will be discussed later.

Early on the morning of July 25th, the date named for reaching Inglefield Gulf by Mr. Bryant in his prospectus, the Falcon entered Whale Sound, the southern entrance to the gulf. Finding the inner portion of the sound covered with unbroken ice, the vessel passed between the Northumberland and Herbert Islands into Murchison Sound, the northern entrance to the gulf. This was also found covered with ice, and after searching in vain for a practicable way through it, the Falcon was made fast to the ice, only some forty odd miles from her primary destination, which she would have reached on schedule time but for the unusual tardiness of the breaking up of the ice. The persistence of the ice here, and along the coast of Ellesmere Land, and in Jones Sound on the west side of Baffin's Bay, rendered the geographical work contemplated by Mr. Bryant almost fruitless. It very considerably modified my own work, and caused some loss of time, but was not without its very considerable compensations, so far as my part of the work was concerned. By reason of their detention I became much indebted to the other members of the party, and particularly to Professor Libbey, for hearty and very considerable aid. Thwarted in their own immediate plans, they turned cordially to the other scientific work which was available; and it is well-nigh impossible to be detained at any point on the coast north of Cape York where glaciers and ice caps profitable for study are not near at hand. To Professor Libbey's rare skill in photography science will be indebted for many choice views of glaciers which the kodak, my own rather uncertain dependence, might not have furnished, though this proved better than I had reason to expect, and out of the 350 views taken I shall find ample illustrative material.

On the day following our arrival a base line was measured on the ice under the superintendence of Professor Libbey, and with the assistance of Mr. Bridgman and Dr. Wetherell, with a view to the more accurate mapping of the surrounding region. This was abandoned the next day, however, for the ice having relaxed and a lane having opened northward, the Falcon moved to a point close in to the north shore, opposite the Igloodahomyne glacier, in the hope of finding broken ice and a practicable passage along the north shore. The Igloodahomyne glacier was examined by Professor Libbey, Dr. Wetherell, and myself on the following day. During the next two days the vessel was advanced several miles into Inglefield Gulf, where it was again arrested opposite the glaciers of the Red Cliff peninsula, which furnished a profitable field of study until August 4th. Meanwhile, communication had been opened over the gulf ice with Lieutenant Peary's headquarters, and we learned with extreme regret that the extraordinary severity of the spring storms on the ice cap had so nearly destroyed his dog team, and had so far crippled his men, as to compel a return to headquarters and a postponement of his exploration of the extreme borders of Greenland until next year.

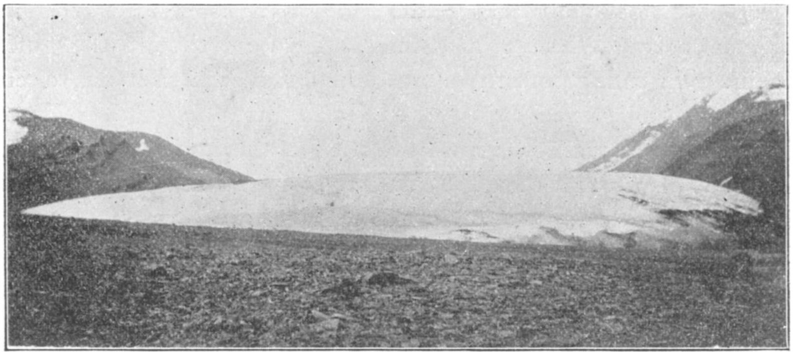

FIG. 5. The Igloodahomyne Glacier, near mouth of Murchison Sound, North Greenland. A dependency of the inland ice.

On August 4th, by invitation of Lieutenant Peary, I accompanied him to his headquarters, Anniversary Lodge, on Bowdoin Bay, (Lat. 77° 44′), and made that a working centre until August 23rd. Here, with the great ice cap near at hand, the local ice cap of the Red Cliff peninsula directly opposite, and nine glaciers of varying forms and habits within a half dozen miles, I enjoyed every facility which the phenomenal situation and the great kindness of Lieutenant Peary and his party could furnish. In no small degree the misfortune that turned them back was my gain. Lieutenant Peary's intimate knowledge of the region, his wide observation upon the glaciers of middle and northern Greenland, his counsel and his personal guidance, and his ample equipment for northern work, all of which were freely placed at my service, were of incalculable aid to me. Mr. E. B. Baldwin, meteorologist to the party and an enthusiast in exploration, was my nearly constant guide and companion, and did all in his power to aid in the work. One would be indifferent indeed, if, under these circumstances, he did not press the work to the utmost limits of physical and mental endurance, for the continuous daylight put no limit to daily hours.

I learned with gratification that Lieutenant Peary had undertaken the mapping of the geographic features of a large territory adjacent to Inglefield Gulf, and that he had commenced systematic observations on certain of the glacial phenomena, among others the measurement of the rate of glacial motion by stakes and transit, and by a series of photographs. This proved peculiarly fortunate, under the circumstances, for, though I went with a full instrumental outfit for measuring glacial movement, and for making such geographic determinations as might be necessary for plotting the glaciers studied, the adversities of the season that made it necessary to leave the Falcon thirty miles from the main field of work, and to make the journey by foot or by sledge over uncertain bay ice, much broken by leads, rendered the transportation of the outfit impracticable. The geographic outlines which I shall be permitted to use in these articles are chiefly the contribution of Lieutenant Peary. The fuller data which he will himself publish in due time, relative to glacial distribution, movement, and many other features, will be an important accession to glaciology.

A detailed narrative of the excursions made from Anniversary Lodge to the ice caps and to the adjacent glaciers does not seem to me to possess sufficient interest, apart from the results, which will be fully described, to warrant giving it a place here.

Between the 23rd and the 26th of August, the Falcon, which had previously reached the Lodge, visited several points at the head of Ingefield Gulf, and an opportunity was afforded to see, at hand, two of its great glaciers, the Leidy and the Hubbard, and to view from near points a complete panorama of the remarkable group that gathers about the head of the gulf. These lie about one hundred miles back from the general line of the west coast and are opposite the greatest breadth of Greenland's ice cap.

On the 26th of August the return trip was begun, and, besides further studies of coastal topography, a visit to two additional glaciers on Disco Island, and some study of a coastal plain, very analogous to that of Norway recently described in the JOURNAL by Dr. Reusch, the journey possessed little of scientific interest. Floe ice was still abundant along the "Crimson Cliffs" and the coast east of Cape York, but the northern part of Baffin's Bay was free from floes on the line of our passage, and almost free from icebergs. On the coast of Labradors, which we somewhat closely approached, only a few icebergs were seen. We arrived at St. Johns, Newfoundland, on September 15th, which may be said to be schedule time. Here I parted with my aid, Mr. Z. Butler, who had rendered faithful service throughout the trip. Leaving the Falcon at St. Johns in company with Mr. Bridgman, with whom I parted at Halifax, I returned by way of Canada, stopping two days to see the interglacial formations at Toronto, which promise such important evidence bearing on the diversity of the glacial period.

T. C. CHAMBERLIN.